

## Claims:

1. A process for preparing tert-butanol comprising contacting a homogeneous reaction mixture comprising water, tert-butanol and an isobutene-containing hydrocarbon mixture with an acidic ion-exchange resin at from 30 to 120°C, wherein the homogeneous reaction mixture prior to said contacting has a proportion of isobutene of over 10% by mass and a proportion of water which is from 30 to 80% of the amount of water which is possible based on the solubility of water in the homogenous reaction mixture.
2. The process of claim 1, wherein the proportion of water is from 50 to 80% of the amount of water which is possible based on the solubility of water in the homogenous reaction mixture.
3. The process of claim 1, wherein the proportion of water is from 60 to 80% of the amount of water which is possible based on the solubility of water in the homogenous reaction mixture.
4. The process of claim 1, wherein the proportion of water is from 70 to 80% of the amount of water which is possible based on the solubility of water in the homogenous reaction mixture.
5. The process of claim 1, wherein the isobutene-containing hydrocarbon mixture is pure isobutene.
6. The process of claim 1, wherein the isobutene-containing hydrocarbon mixture does not comprise acetylene derivatives, comprises less than 5,000 ppm of dienes and no further olefins having one or more branches on the olefinic double bond.
7. The process of claim 1, wherein a part of the tert-butanol obtained by the process is recycled to prepare the homogeneous reaction mixture.
8. The process of claim 7, wherein the tert-butanol recycled at a recirculation factor from 0.1 to 1.7.

9. The process of claim 1, wherein the contacting is carried out in a plurality of reactors connected in series.

10. The process of claim 9, wherein water is introduced between the reactors.

11. The process of Claim 9, wherein the contacting is carried out in at least four reactors.

5 12. The process of Claim 9, wherein the plurality of reactors connected in series have decreasing temperatures in the flow direction.

13. The process of Claim 12, wherein the contacting is carried out in at least four reactors.

14. The process of Claim 13, wherein the temperature of the first reactor is from 67 to 70°C, the temperature of the second reactor is from 53 to 56°C, the temperature of the  
10 third reactor is from 42 to 46°C, and the temperature of the fourth reactor is from 42 to 38°C.

15. The process of Claim 1, wherein the acidic ion-exchange resin comprises sulfonic acid groups.

16. The process of Claim 1, wherein the proportion of isobutene in the isobutene-  
15 containing hydrocarbon mixture is at least 30% by mass.

17. The process of Claim 1, wherein the proportion of isobutene in the isobutene-containing hydrocarbon mixture is at least 40% by mass.

18. In a method of manufacturing methyl methacrylate wherein tert-butanol is used in the method, the improvement comprising preparing tert-butanol according to the process  
20 of Claim 1.

19. In a method of manufacturing peroxides, the improvement comprising preparing tert-butanol according to the process of Claim 1.

20. In a method of isolating pure isobutene from isobutene mixtures, the improvement comprising preparing the tert-butanol according to the process of Claim 1.